

## RESULTS OF SOIL FERTILITY RESEARCH

by

D. W. L. Read  
Research Station  
Swift Current, Sask.

Presented at the Soil Fertility Workshop  
February 18, 1971  
Saskatoon, Sask.

### Stubble and Fallow tests

The results from the 1970 stubble and fallow fertilizer tests were somewhat different from the results we have obtained since 1966. Low nitrogen levels in the soil at seeding (20 lb on stubble and 54 lb on fallow) and above normal rainfall combined to give good responses to applied nitrogen. In 1967, 1968 and 1969, with less moisture and higher nitrogen levels in the soil there were very few profits and frequent losses from applied nitrogen. The phosphorus response remained about the same in all years—significant increases in yield on soils with less than 20 lb P (0-6 inches) and few increases on soils that contained more than 20 lb P.

### Potassium tests

The tests with potassium at 3 locations during the past 2 years have indicated no need for added K. The soil tests ranged from 160 to 200 lb/acre  $\text{NaHCO}_3$  extractable K, 0 - 6 inches.

### Residual P

Residual P work is continuing in the field, greenhouse, and laboratory. At both Swift Current and Cabri the field yields were increased from each rate of  $\text{P}_2\text{O}_5$  applied with the seed in 1970 on the plots that had received no previous P application. On the plots that

received 100, 200, or 400 lb P in 1966,  $P_2O_5$  with the seed gave no increase in yield in 1970. The yields from the check plots where there was residual P were equal to those obtained from 50 lb  $P_2O_5$  with the seed on plots with no Residual P.

Sixteen crops in the P depletion studies in the greenhouse have reduced  $NaHCO_3$ -P in the soil from the 100-lb and 200-lb rates down to that of the check. The 400-lb rate is still slightly above the check. The recovery of the applied P measured as greater uptake by the plants on the fertilized pots compared with the uptake from the unfertilized pots accounts for almost 100% of applied P at the 100-lb and 200-lb rates. About 90% of the P has been recovered from the 400-lb rate.

Fractionation of the P in the soil and " A value " work is being carried on.

#### Forage

The increases in yield, % P in forage and the P uptake by forage crops was compared with available P in the soil at different depths. The available P in the top 6 inches correlated most closely with these 3 factors on dryland forage. On irrigation the highest correlations were from 0 to 24 inches or deeper. This indicates that the 0 to 6 inch depth of sampling is satisfactory for recommending phosphatic fertilizers for dryland forage crops, but we should be sampling to 2 feet for irrigated forage crops.

## SUMMARY

### Cereal Section

Experimental Farm, Indian Head, Sask.

E.V. McCurdy

The growing season at Indian Head in 1970 was quite unusual. Precipitation from April 1 to July 31 totalled 12.57 inches compared to the 74-year average of 8.27. Reserve soil moisture was excellent in stubble fields as well as in summerfallow. The total hours of bright sunshine (2357.3 hours) was much above normal, an all time high being recorded in the month of August. Temperatures were close to normal and evaporation was slightly below the long time average. The period between the last killing frost in the spring and the first killing frost in the fall was 155 days. These factors all contributed to high yields and accounted for late sown crops yielding as well as they did.

Rates of seeding wheat under different conditions in the southeast of the province were studied again in 1970. A rate of 2 bu/acre produced the highest yield at Fleming. The optimum rate at four other locations was 1 bu/acre and at a fifth, 1.5 bu/acre. Crops matured more rapidly as the rate was increased. The difference in some cases between the very light rate and a heavier rate was greater than the increase resulting from the use of commercial fertilizers. For the past two years the 1 bu/acre rate at Indian Head has appeared the most satisfactory, particularly from the standpoint of maturity.

All rates of barnyard manure have increased yields. These increases are showing up more now than in the early years of the experiment. Available P has increased, but in 1970 N tested low in all stubble plots. The need for additional N was very obvious as these stubble plots did not produce nearly as well as adjacent plots where the N need of the crop was properly met.

Rates of 20 to 100 pounds of 11-48-0 have been applied with wheat sown on summerfallow for the past 26 years in a field that tests low in P and high in N. Over the years the available P has increased considerably in the plots where the 100 pound rate was applied, but the response to fertilizer is remaining about the same. The response to P was much lower than normal this year. Forty pounds N more than doubled the yield of the stubble wheat in 1970 in this group of plots, irrespective of the past fertilizer history of the plots. In a fertilizer rate test, yields of wheat sown on stubble were increased progressively as the rate of N was increased from 0 to 60 pounds. There was no response to P in this test.

The yield of wheat sown on fallow, with or without fertilizer, was not significantly affected by the forage crops that had been grown on the area previously. Stubble crops showed a marked increase where alfalfa had been grown. Although the response to additional N was not quite as great as on the plots where grass had been grown, the total yield was greater. On fields where a grass-legume mixture was left down for three years out of every 9 years, for the past 59-year period, the increase resulting from phosphate fertilizer was negligible. The response of oats sown on stubble to N has also been low. None of these fields tested low in N.

Wheat has been sown continuously on some plots for 13 years. These plots have averaged 23 bu/acre when 80# 23-23-0 has been applied with the seed. This is equivalent to 46 bu/acre in a 2-year rotation and is the highest per cultivated acre of any of the rotations we have under study.

In a field where soil tests have been taken for the past 4 years, the available P has averaged 32 lb/acre. Yield increases resulting from the use of P have been very small. In the same area the  $\text{NO}_3\text{-N}$  on stubble plots averaged 31 lb/acre. Large yield increases resulted from the use of 40 lb N.

Under 1970 conditions the fall application of N was more satisfactory than spring. Increases resulting from the use of urea have not been quite as high as with ammonium nitrate.

When 20 lb/acre of nitrogen was applied with flax sown on stubble, the yields were not as high as when the N was applied on the soil surface.

For the past 4 years 11-48-0 has been applied with rape sown on summerfallow. The response is greatest under favourable moisture conditions. in 1970, when 80 pounds of 11-48-0 was applied, rape yielded 829 lb/acre compared to the check yield of 421 pounds. The increase was continuous as the rate was increased from 10 to 80 pounds.